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Problem and Project Based Learning in Hybrid Spaces: Nomads and Artisans

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Abstract

There is a need within networked learning to understand and conceptualise the interplay between digital and physical spaces or what we could term hybrid spaces. Therefore, we discuss a recent study of students from two different programmes who are engaged in long-term, group-based problem and project based learning. Based on interviews, workshops and observations of students' actual group practices in open, shared and flexible spaces in Aalborg University (AAU), we identify and discuss how students incorporate networked and digital technologies into their group work and into the study places they create for themselves. We describe how in one of the programmes 'nomadic' groups of students used different technologies and spaces for 'placemaking'. We then show how their experience and approach to collaborative work differs to that of the more static or 'artisan' groups of students in the other programme. In both cases the ways of utilising space, places, tools and activities was an extremely complex interweaving of the digital and physical and of different places and artefacts over time. Thus, we argue 'placemaking' is an important practice or literacy in relation to students' 'doings of networked learning' and one that impacts on the kind and nature of collaboration that takes place.

Keywords

Problem and Project Based Learning, Collaboration, Hybrid spaces, Placemaking

Introduction

While there have been several studies of students use of networked spaces, digital technologies and social media the focus has tended to be on how the so called new or 'net generation' campus based student engages with technology and/or social media in their study practices (Jones & Healing, 2010; Selwyn, 2008). Overall the research has not shown dramatic changes in the way students incorporate different technologies into their study approaches beyond using social media to support coordination and information retrieval (Hrastinski & Aghaee, 2011). However, as noted by Henderson, Selwyn and Aston (2015) there is a lack of knowledge as to why students make use of specific technologies in their studies. In addition, the authors call for higher educators to design more creative, participatory and active learning using technology in order for students to move beyond what they term outcome-focused use of technology. At the same time the prevailing interest within networked learning in the use of networked technologies to support collaborative or dialogical learning have, as pointed out by Goodyear Carvalho and Dohn (2014) generally focused on the types of online learning that takes place off campus and in the form of distance education courses where students connect to forums and resources, but seldom meet physically. Increasingly HE institutions are however adopting collaborative group based activities and projects into the curriculum for both on and off campus students. There has however to date been little attention given to the way digital technologies and social media have been adopted and incorporated by students to support this increasing requirement to engage in collaborative group work (Henderson et al., 2015). This is despite the pervasive if not yet universal availability of wifi-access, laptops and smartphones on many campuses.

As argued by Carvalho, Goodyear & de Laat (2015) there is a need within networked learning to understand and conceptualise the interplay between digital and physical spaces and artefacts i.e. hybrid spaces. Consequently, in

this paper we discuss a recent study of students from two different programmes who are engaged in long-term, group-based problem and project based learning. Based on interviews, workshops and observations of students' actual group rooms in open, flexible, and shared spaces in Aalborg University (AAU), we identify and discuss how the students incorporate networked and digital technologies into their group work and how they appropriate the spaces made available to them. This process of appropriating and inhabiting a space we refer to as placemaking. The space is that which is given, whereas place is what we make of it (Ponti & Ryberg, 2004).

In the paper we describe how in one of the programmes 'nomadic' groups of students used different technologies and spaces for 'placemaking'. We then illustrate how their circumstances for collaborative work differ to those of the 'artisan' groups of students in the other programme. In both cases their practices of placemaking were a complex interweaving of digital and physical spaces, places, activities, tools and time. To this extent we argue 'placemaking' is an important practice or literacy in relation to students' 'doings of networked learning' and one that impacts on the kind and nature of collaboration that takes place.

Background to the study and data Collection

In a new building, AAU students and teachers from different study programs (e.g. Architecture and Design (A&D), Art and Technology (A&T), Communication and Digital Media (CDM)) are exploring how various open, flexible and shared spaces can support problem and project based learning. In AAU students work with problem based group projects every semester. The courses are designed to support the students by providing introductions to relevant theories and methods that students can potentially employ in their problem based project work. Generally the project work lasts 3-4 months where students go through different types of enquiry: problem identification, problem formulation, theoretical and methodological inquiry, data collection, analysis and discussion (Holgaard, Ryberg, Stegeager, Stentoft, & Thomassen, 2014; Kolmos, Fink, & Krogh, 2004).

Each educational program has access to their own areas in the new building where they can make room for the students' activities. The different programs provide a setting and some basic resources (e.g. tables, chairs, power, wifi, whiteboards, etc.). In this study, we examined how the CDM and A&D students work in groups and how they supported their project work by using a range of mediating artefacts. The CDM students have no permanent workplace. They are 'nomads' travelling around the building and other places nearby (e.g., cafes, public library, etc.) to find a workplace on a daily basis. In contrast, the A&D students have a permanent group room in an open and flexible area, which they can design as they prefer. In total, 13 groups populate this open area. Thus, there is a difference between the groups of students in terms of available space, however in both cases the students have to modify and inhabit the spaces to align with their own needs and preferences.

Data collection

In order to explore how students appropriate and work in the different learning spaces and environments at AAU, we have observed students in their learning environments and conducted a two hour interview workshop with students from both CDM (6th semester) and A&D (4th semester). The interview workshops were divided into three stages: basic introduction to the research, questions on the students' experiences from their project work and finally each of the students produced a poster explaining relations between space, tools and processes in their group work. The interviews and posters serve as background to understanding students' group work, but have since been followed-up via video observations, impromptu in-situ interviews with the students, as well as casual observations as part of students inhabiting public working spaces and environments.

Students Appropriation of Spaces and Tools: Nomads and Artisans

To explain the two different student groups' ways of appropriating and inhabiting artefacts and spaces in their 'placemaking' we produced two narratives. Each narrative is based on our analysis of the interviews and observations of the groups. The narratives help to convey a broader and more complex set of data to the reader in a comprehensible and succinct manner. Before each narrative, we present some background information about each of the study programs. Then we analyse, discuss and present the findings from the workshops and observations.

Students as Nomads - the CDM students

Students on the CDM BA program work within a thematic framework on each semester (e.g. analysis of communication products); however, the framework is broad and individual groups can work with different problems in relation to the overall theme as a reference. Thus, each group work with their own choice of theories, methods and tools in order to address the problem - a problem (research question) they have to identify themselves. Although there are some overlaps between the groups they work in parallel without much interaction or knowledge sharing. The CDM students have few group rooms available for their group work as the entire student cohort share 9 group rooms (approximately 450 students). These rooms can only be booked for half a day and the students have to take this into account in their everyday planning.

The Nomad Narrative: Setting up temporary camps

Anders, Bettina, Claus and Dorthe had just left today's lecture and wanted to continue their work from yesterday's group meeting. Dorthe brought the post-it notes with her from home and Anders finally picked up the book from the library. Bettina and Claus were keen on sharing their work on the method section, which they had worked on in a Google doc during the night. Claus was unsure about the status of the document, as Bettina spent a couple of hours editing their work after he went to football. They sit down outside the lecture hall but need to find a room or a place in the hallway as they all need power for their laptops. They would have liked a group room and a projector to view the document together, however, they did not reserve one of the group rooms for today and all the projectors were out on loan. The group decides to walk to the staff area to see if one of the meeting rooms is available. They find a temporary dwelling spot and unpack their computers, phones, tablets, pens and post-its in the meeting room. They all start charging their devices but then one of the professors knock on the door - the room is reserved for a meeting. The professor suggests that they move to one of the allocated group rooms, but the group decides to sit in the hallway, since there are no rooms available. Here they unpack their things again. They open their computers to view the document - and Dorthe puts out the post-it notes on the table. While reading the method section produced by Bettina and Claus each of them adds comments and suggestions to the shared Google Doc. Anders reminds Bettina and Claus about relevant literature from the lectures, which is available for download in Moodle. The group decides to split up and work from home. Later they will meet in Google Hangout to discuss the comments. Tomorrow, they go to the nearby library to find a space to work.

Spatial: Nomadic Culture, Improvised Spaces and Local Knowledge

The CDM students are travelling with a light "bundle" of artefacts for their group work e.g. computers, tablets, pen and paper, post-its and tape for setting up their work camp in new places. They are used to this nomadic way of working and they are used to temporarily appropriating different spaces. Some of the students mentioned cafés as alternatives to sitting at home. Likewise the library (both the university and the public) were venues used for work. In this sense the students operate based on what could be termed 'local knowledge'. The CDM students try to strategically decide when it is necessary to book a group room, and when to exploit other facilities in or outside the university. They are aware that some of their activities can be dealt with in the cantina area or in other places (cafes, public library or at home). In this sense the students continuously need to balance their needs, tasks and spaces in relation to each other. Do they need to discuss? Do they need silence, a projector, to work together or alone? These are concerns and shifting needs they take into account in choosing appropriate temporary spaces for their work. Below a small excerpt where one of the students explains this as we are discussing their use of the cantina area:

Well, we used it a lot right after a lecture or the like - quickly getting together and agreeing on things for the next day. Then we just sat in the cantina area and got on top of tasks for tomorrow. So it was more like the minor task we sorted there, and then you could book a group room for the next day if necessary.

So, while the cantina works for minor tasks it is a noisy place and it lacks electrical outlets, so students seep into other areas or group rooms as they deem necessary in relation to the task (and what is available). In this way 'local knowledge' seems to be part of the students' skills (or tricks of the trade if you will). The shifts between different spaces and moving from open (cantina), to semi-open (open office spaces) and more closed spaces (group rooms) are illustrated by one of the students later in the interview workshop (

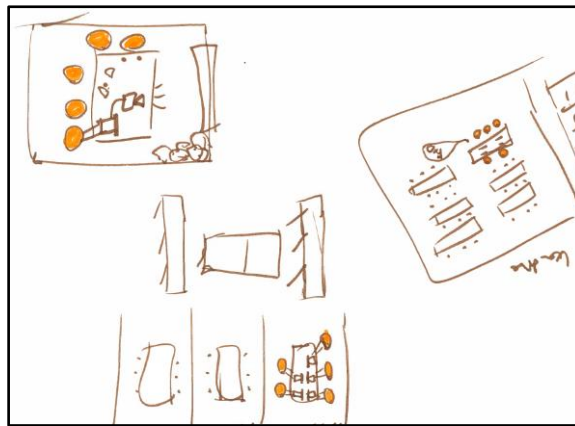


Figure 1: Illustration from workshop with CDM students

Apart from the local knowledge, there is also a certain streetwiseness, slyness and cunningness to the students' way of working e.g. they mention (others) forging booking sheets. Thus, when booking they take pictures of the sheet to document the reservation. From hard experience they learned that other students sometimes replace, remove or forge the sheets. They equally talk about using (or squatting) closets that are not their own, temporarily using 'forbidden' spaces e.g. the areas of the A&D students which are the open office spaces. Thus, the students in many ways seem quite entrepreneurial when it comes to working in different spaces and setting up temporary camps - likewise there is a certain ingenuity and craftiness in their use of tools and artefacts for their project work.

Artefacts - Emerging hybrid spaces

The students alternate between different spaces, but it became clear that in their nomadic placemaking they also shift seamlessly between different artefacts during the course of their collaborative group work. While digital and networked technologies were omnipresent in the students' accounts it was clear that they used many 'physical' and non-digital artefacts - pens, post-its, paper, and blackboards.. These are obviously technologies as well though we often reserve this label for 'new' technologies or digital artefacts. While some of these artefacts were intransient, stable tools - such as pens, post-its etc. there were also examples of transpositions of various artefacts. For example, the students give accounts of how non-digital representations are digitised or how digital representations e.g. digital mindmaps are remade, re-enacted and restructured on post-it notes and paper. One of the students said about mindmaps and work-plans.

Typically you have them on your computer. But both here and in [location] we have [...] used the blackboards that were present to establish an overview and get it up in a bigger format, so there is a good overview for group of what we are working on at the moment.

Likewise another student reports:

We have sometimes used MindMeister [auth: online mindmapping tool] where you can create a mindmap or brainstorm and then put it in there. Because then you can have it on all screens simultaneously, but equally we have been really good at sitting with different pieces of papers that we have pasted together and then sitting with pens, and just - yeah - played around on paper because it is easier to move around when we don't have a fixed space in which to sit. So we have just had a closet where we have placed it when finishing and taken it out again next time.

In these quotes we see how the students alternate between digital and non-digital artefacts, but equally how representations - for example an overview of tasks - might be in a Google Docs, then renegotiated and reorganised on a temporarily available physical blackboard to be re-inscribed in Google Docs. In this sense their resources are continuously alternating between different media and modalities as their work develops or their physical, spatial conditions change. However, at all times for the nomadic group's online spaces for communication and digital storage are important and are part of the mobile camp equipment they carry around i.e. the resources they can flexibly deploy and assemble when moving between camp sites. It is quite clear from

this study (and from previous studies ((Rongbutri, Khalid, & Ryberg, 2011)) that Facebook, Google Docs, Dropbox, Hangouts, and Skype are prevalent and omnipresent in the students' group work practices. This mixture is negotiated in the groups, for example should they rely mainly on Dropbox or work in Google Docs? Should they communicate in a Facebook group or arrange meeting via texts? Do they want to use an advanced project management tool or is that too difficult and time consuming? The mixture of tools vary across the groups depending on the preferences and competences of the group members. As some of the students discussed, they develop practices in the groups over time. Each group member has certain preferences regarding the use of tools for communication, collaboration, and coordination which they bring into their new group. Thus, students continuously negotiate and refine their use of artefacts as part of their project work and placemaking. From our observations it is clear that the work and placemaking of the nomadic groups is supported through a dynamic, flexible and mouldable assemblage of digital and non-digital spaces and artefacts. The needs and means to support their work, however, also change over time and depend on the type of tasks and the organisation of the work they are currently involved in.

Temporal and processual aspects

As one of the students outline in Figure 2 they inhabit different spaces depending on the type of work they have to do and the organisation of that work i.e. the temporal and processual aspects of the work: are they in an initial exploration phase or deeply engaged in collaborative writing? But it is also related to the organisation of the work and how the work is distributed. Sometimes they divide labour and distribute tasks to each individual with or without the responsibility to coordinate with others. Reading, for example, can be an individual task, whereas working on different chapters in the project demands a higher degree of coordination. Sometimes they work closely together and need to have joint focus and mutual attention, at other times they split up and work from different locations (home, cafés, and libraries). These temporal, processual and organisational aspects are explored in the illustration below:

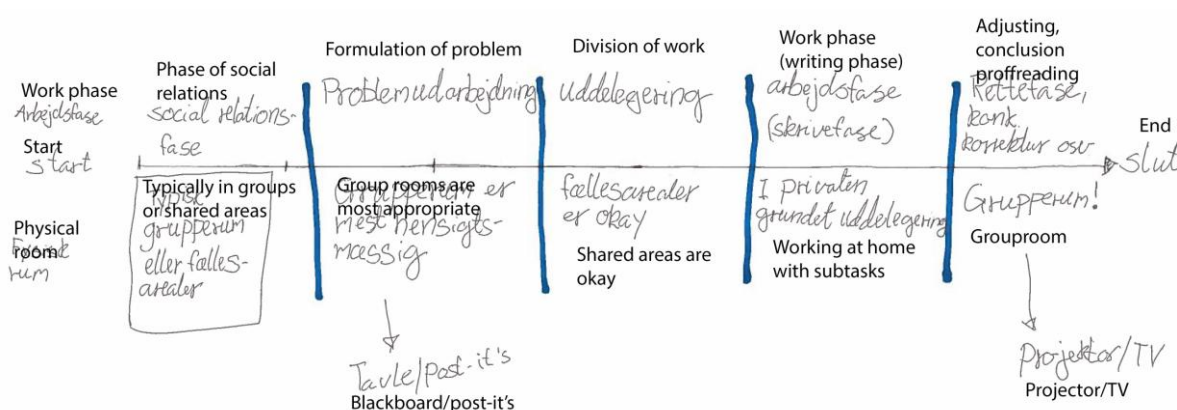


Figure 2: Illustration from workshop with CDM students

In the illustration we also see how their collaboration patterns shift through various phases. This affects the spaces they need, but equally the artefacts they adopt or have available. For example, they like to sit together in the beginning to socialise, but also to establish the main problem/research question. This is followed by phases of more cooperatively organised and distributed work with some common meetings. Finally, they seem to come together towards the end for an intense sprint. Towards the very end of the project period our observations were that the students desperately lump together in any available space around projectors, tv-screens or whatever possibility they have to view one common document.

Two students illustrate differently the phases of their work and the group dynamics. One appearing to draw on Tuckman's phases of group work model using the words: Form, storm and norm explaining that after the forming;

Then we come into this storm phase where there isn't - everyone think it is wrong what we are doing and you fall out with each other [...] so there it becomes divided and here it also becomes more flexible, or more dynamic in terms of how you use rooms and the physical spaces etc. So, it is in that phase - I don't think it matters if we sit in the same room, because we discuss a lot of different things, so we go to many different places [...] and this is also where you split up and divide the work, and "you do this", "you do this".

Another student separates - a bit jokingly – their work into three phases: A serious initial phase, where time estimations and work plans are crafted; a more relaxed ‘we’ll manage it’; and a final ‘we have to pull ourselves together and sit intensively together’. Regardless of the words or labels they use to describe these phases it is clear that the particular tasks or phases they are in make them seek out and placemake with different spaces and artefacts. Staying within the metaphorical framework of the nomad culture one could view it as seasonal places (spring, summer, autumn, winter), but also phases that are associated with particular stages in their work and the relevant activities and tasks.

Students as Artisans - the A&D students

Every group in the A&D programme are working with the same overall case each semester e.g. a new building site or particular area of a city. The groups might work with different sites or areas within the larger site, but the overall case and theme are the same. The different groups, however, apply different theories, methods and practices to solve their sub-problem, which they have identified and formulated. The 13 groups of A&D students have permanent group rooms in an open and flexible area, which they can design as they prefer. The students refer to these rooms as 'studio spaces'.

The Artisan Narrative: It Feels Like Home!

Anders, Line, Søren, Smilla, Jonas and Clara just returned to their group room after today’s lecture. Before they continue with their work they evaluate the lecture and pick up some lunch in the cantina. Today Anders and Line have to go at 4 PM, but the rest of the group will stay for a couple of hours working on different tasks. Jonas and Søren leave to go to a nearby traffic crossing to study shared space. Here they observe how pedestrians, cyclists and drivers use the shared space. While Jonas and Søren are out, Anders work on a 3D rendering of one of the buildings the group has designed. Clara is working on the format of their report, while Smilla and Line glue together pieces of wood to form the architectural model. Then Jonas and Søren return, they immediately share their experiences from the field trip. Clara picks up some of the photos they left in one of their lockers and hangs them on the wire above their working table. She wants to show the rest of the group some of the examples of shared spaces she found the other day. They all discuss the input from the field trip and the examples on the wire. Then a student from another group drops by and asks for help with the 3D software. Søren gets up and walks with the classmate to the neighbouring work space. The rest of the group continue discussing the idea of shared space. Anders suggests contacting their supervisor over Google Communities to get some advice and feedback. Instead of contacting their advisor directly they write a public message in the Google Community. In that way the rest of the students can comment on their question as well. Anders and Line leave and the rest of the group member’s work individually, sometimes asking questions or showing their work to each other. After a couple of hours they all head home. They leave their work on the table and update the calendar on the noticeboard with tasks for the next days. They bring their laptops home to work on some diagrams and models, which they upload in their Google Drive later in the evening.

Spatial: Artisan Culture, Sedentary Dwelling and Knowledge Exchange

The A&D group we interviewed referred to their studio space as a “home” - a place for dwelling (Christiansen, 2006) and being together as group. When using the term “studio” we refer to it as a physical place where products, materials and knowledge is produced with different artefacts through various activities. It was also clear from observations over time that the studios are modified and changed during the different phases of the project period (see also Figure 4). Their group work area is located right next to the CDM group rooms and the two different student groups get to experience each other's practices of doing problem and project based learning. The CDM students' group rooms are closed rooms but not allocated to any one specific group. While the individual A&D studio spaces are separated by moveable notice boards or blackboards they are open. The activities taking place in them are visible for persons walking by (see Figure 3). The area thus resembles an artisan’s quarter with different studios and student artisans moving around “exchanging” knowledge and “tricks of the trade” with each other. For example, we observed how rendering experts from other groups instructed and gave advice to this group. There is a vibrant and material culture existing amongst the students and it seems there is a mutual agreement between the students to help each other with different kinds of problems.

When taking the studios into use (placemaking) the different student groups decorate, structure and lay out each area according to their current needs and preferences. The studios also reflect the way the individual group prefers to work, e.g. use of blackboards, number of tables etc. Moreover, we see changes in the way the group arranged themselves in the studio as a response to the phase and type of work. Besides having a home-like feel,

the students described how they gained inspiration for their projects by visiting the other groups. Similarly they followed other group's activities on online platforms, e.g. Pinterest and Google+ Communities:

[...] if you walk around the large group area and find something cool made by another group, then you can also look up the group in Google + in order to find what they have shared.

In the large open area the students are exhibiting their products, crafts and working methods for collective assessment and inspection. The shared areas and the surrounding hallways often serve as places for breaking out into smaller and spontaneous teams to solve a particular task which does not require attention from all the group members. The students in the group are quite aware of each other's skills and competences. For instance, Clara wants to learn more about 3D modelling in Revit on this semester, which Søren is an expert in using. Thus, they have agreed to make room and time for Clara to do some of the 3D modelling in the project. In this way, it seems that each group (also in-between the groups) have a certain element of apprenticeship learning embedded as part of their work (Lave & Wenger, 1991).

Artefacts: Transpositions

The use of artefacts - pen, paper, foam rubber and software etc. - is part of the knowledge that the students obtain in their projects and as a part of working in different groups each semester. The A&D students use many of the same networked technologies as the CDM students, e.g. Google Drive, Facebook and Dropbox. However, they also use other services to support their creative work processes. For example, they make use of Pinterest to share photos of buildings, parks, rivers, roads, people and trees to inspire each other and to inform their design solutions. Interestingly, the photos which they "pin" digitally are also printed on paper and hung on wires and notice boards in their studio. These transpositions between the digital and physical serve as important ways of structuring the group's ways of thinking and acting. With the photos hanging on wires above their workspace they are constantly close to inspirational sources. Sometimes the group rearranges the order of the photos as they develop new hypotheses and ideas from their work.



Figure 3: Picture of A&D students' group room

In general the group members differentiate between two phases in their project work: 1. A creative phase where they make use of different materials and methods to challenge their understandings and beliefs about their design. 2. A more concrete phase where they use software to produce more accurate designs based on numbers and measurements. This is explained by one of the students and his/her poster (Figure 5).

I have tried to visualise how it is in the group room and the idea phase vs. when we start working with computers, because it is very messy - a lot of brainstorming and idea generation - visualised by squiggles here and a piece of paper with folded manifolds torn off and ideas put on the notice board with ideas and then when we start working with the computers it is getting more accurate and to scale and it can of course still be 3D.

In the creative phases (e.g., brainstorming, sketching, gathering of inspirational photos etc.) the group often use manifold paper for individual and group based processes. A manifold paper is a lightweight transparent paper, which the students use for sketching. For example, one of the group members describe how they decided to sketch out their individual proposal for the architecture and design on a piece of manifold paper, which they then passed on to one of the other group members. Then each of them had to draw on top of the other member's

drawing on a new piece of manifold paper. In doing so they noted what they carried forward to the new drawing, thereby constructing a set of shared “requirements” or “design briefs”. Later on they might return to some of their initial drawings on the manifold to revisit an idea. Finally, they bring all their manifolds to the exam in order to demonstrate their process of creating the final product.

Temporal and processual aspects

In their studio the group uses a notice-board to create a calendar by putting masking tape on the board dividing it into weeks and days. Every day the group (primarily Smilla and Clara) positioned and repositioned post-its in different colours (yellow=courses, pink=group members away, orange=project work) on this “home-made” calendar. As one of the students showed in the illustration (Figure 5) the studio space was tidy and organised in the initial phases of the project.

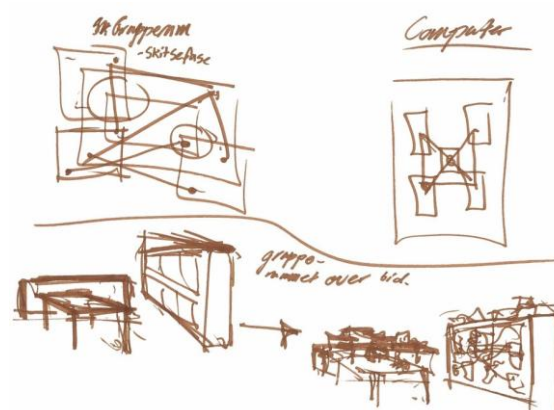


Figure 4: Illustration from workshop with A&D

As the deadline was approaching however it became more and more messy and chaotic. One of the students described the initial phases as periods of puzzlement and somewhat chaotic with loads of brainstorming and sketching. Ideas are then transformed into digital representations, that are more 'precise' and 'accurate' models of the designs, which however can be opened and re-negotiated. However, similarly to the CDM students we can see how processual aspects are tightly interwoven with the needs and uses of different physical and digital spaces and artefacts.

Concluding Discussion

There are a number of different points we would like to draw out from this study. As the study illustrates the way nomadic and artisan groups of students' appropriate spaces, places, tools and activities over time is a complex interweaving. We would argue that the notion of placemaking activities in hybrid spaces i.e. the mixture of physical and digital spaces should be an increasingly important area of attention within networked learning.

To this end we have explored two overarching metaphorical frameworks to understand the differences in these students' work patterns resulting from their different socio-material conditions. We have described 'the nomads' who continuously have to move around and set up temporary camps, and therefore travel with a light bundle of artefacts, such as a computer, pens, postic notes. They are characterised by a certain 'streetwiseness', slyness and local knowledge. They are creative in occupying available spaces and need to consider when to work together and when to work distributed. On the other hand we have described 'the artisans' that have their own studio, which is almost like a home to them. A place where they can leave designs, models and manifolds on the tables, plans and overviews on the 'walls', and where they can hang inspirational material from wires and on the pin-boards.

What struck us were the strong networked learning principles that the spatial organisation seemed to facilitate for the artisan groups i.e. the collaboration, peer-learning and informal exchange amongst the students. Unlike the nomads they are part of a community that is set in the artisans' quarters where other people have their studios, and where they learn from each other. Directly through helping each other with programs and designs, and more indirectly through the inspiration they glean from the open studios. These knowledge spill-overs

(Rienties, Nanclares, Hommes, & Veermans, 2014) are interesting and also occur in their virtual working spaces. These are elements that appear to be absent in the nomads' organisation of their work spaces. While knowledge seems to travel from group to group across semesters as members form new groups (see also (other NLC2016 Paper - anonymised)) it seems harder to detect the same kind of immediate peer-learning and inspiration amongst the nomadic CDM students. This could be happening to some extent in the students' Facebook group for their semester but no mention of this surfaced during the interviews. It is an area that could warrant further study and equally to explore whether it might be possible to encourage this type of peer-learning amongst more nomadic project groups (see also (Ryberg, Buus, & Georgsen, 2012)). It did appear that the different socio-material conditions had an impact on the ways in which the group's set about placemaking and practicing problem and project based learning. In many ways the nomadic students are quite entrepreneurial and seem to handle their shifting working conditions well. However this study suggests that there does seem to be some advantages to the organisation of the A&D programme with their own studios - particularly for the peer-learning and knowledge. Further, we should not romanticise the conditions of the CDM students. They do not actively choose a nomadic life - it is simply a condition forced upon them for economic reasons. The CDM students would prefer having similar conditions to the A&D students and have spaces of their own, rather than living as academic scavengers. The A&D students are perhaps more dependent on having a space for models and designs, as this is an important part of their profession, whereas the CDM students are more textually oriented (although often working with design tasks). However, they also need to maintain an overview of their work - an overview the A&D students can embed in their physical spaces (calendars, blackboards, post-it notes, pictures on wires etc.).

Whilst there are some differences amongst the groups, there are also overlaps. For one thing, both student groups have developed repertoires of interesting practices of 'placemaking' in different conditions. Gourlay and Oliver (2014) argue that digital literacy practices are intimately coupled to the socio-material environments and resources students are set in:

[...] learners' practices are shaped in important ways by the social and material environments in which they are enacted, and that learners are engaged in an ongoing, improvisatory process of both adapting to the environments in which they work, whilst also adapting these environments. (Gourlay & Oliver, 2014, p. 145)

In this vein we suggest that we could view placemaking as a particular type of (digital) literacy practice; and one which is more complex than it immediately sounds. As we can see from the data, students' adapting and adopting to the environment are complex dances that involve not only which artefacts to use, but rather in what spaces particular entanglements of tools and activities are appropriate - often dependent on the processual aspects (are they in an early explorative phase, or in a production phases where work can be distributed). This knowledge seems to be both endemic and tacit amongst the students, and yet it seems we are only beginning to understand the complexity of such group based placemaking processes involving mixtures of digital and physical spaces, activities and tools. This highlights another point we would like to draw out; namely the fluid boundaries between the 'digital' and 'physical' to the degree where the very distinctions seem to become superfluous. The digital spaces are always present in the physical spaces, and we see from the data how various artefacts are transposed from digital representations, to a blackboard and post-its and then re-digitised. We see how Pinterest images are printed hung on a wire and how their spatial, physical arrangement is re-organised as ideas or designs change. Thus, the digital and physical are heavily interwoven and difficult to separate. In this vein we argue that the very notion of 'digital technologies' can be problematic and that we should rather attempt to understand in more depth how the students use artefacts and appropriate various spaces. An overly strong focus on the 'digital technologies' might make us overlook important aspect of the practice of collaborating in hybrid spaces and the complex entanglement between physical and digital artefacts, spaces, activities and time.

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